

Name:

Student ID#:

Statistical Pattern Recognition (CE-725)
Department of Computer Engineering
Quiz #5 (Statistical Classification) - Spring 2011

1. **(3 points)** Consider a decision problem using one-dimensional feature vectors. Find the Likelihood Ratio Test for the following two class conditional densities:

$$P(x|w_1) = \frac{1}{2}e^{-\frac{x}{2}}, x > 0 \quad P(x|w_2) = \frac{1}{4}xe^{-\frac{x}{2}}, x > 0$$

Hint: You must calculate the $P(x|w_1)/P(x|w_2)$ ratio.

2. For the above problem, find the thresholds of likelihood ratio for the following cases:
a. (2 points) Bayesian minimum risk, with $\lambda_{11} = \lambda_{22} = 0$, $\lambda_{12} = 1$, $\lambda_{21} = 2$, $P(w_1) = 2/3$, and $P(w_2) = 1/3$.

Hint: For example, the threshold of likelihood ratio for Class Conditional Method is $T=1$, or the threshold of likelihood ratio for MAP Method is $T=P(w_2)/P(w_1)$.

- b. (5 points)** Neyman-Pearson with $P_{FP} = 0.1$.